

## Comments and Responses to Dr. Gregory Boardman

### Calleguas Creek its Tributaries and Mugu Lagoon Toxicity, Chlorpyrifos and Diazinon TMDL

Response to Technical Review of Gregory D. Boardman, Ph.D., P.E., DEE, Department of Civil and Environmental Engr.  
Virginia Tech, dated April 29, 2005

	Reviewer's Comment number	Comment	Response
1	<ul style="list-style-type: none"> <li><b>Reviewer's Overall Comment</b></li> </ul>	<ul style="list-style-type: none"> <li>Overall, I feel this report is comprehensive and well done. There are, of course, many unknowns and it is generally not possible to collect all the information one will need for a TMDL. Thus, the authors have had to do some detective work, extrapolate a bit, compare results from different sources, and make some educated guesses. I agree with their approach and was impressed with the recommendations here and there throughout the report that the TMDL analyses will be dynamic and improved as more data are collected. The fact that the two main chemicals suspected of causing toxicity problems (chlorpyrifos and diazinon) will be better controlled and/or phased out for non-agricultural uses in late 2005 serves as a means of validating the worth of this TMDL over the next 5-10 years. Based on the wet and dry weather estimates (section 5.4), instituting BMPs for the agricultural areas should yield significant benefits. Having said the positive, I will now offer some comments that I hope will improve the report and/or stimulate thoughts and discussions amongst the people who will move this work forward.</li> </ul>	<ul style="list-style-type: none"> <li>Staff agrees.</li> </ul>
2	<ul style="list-style-type: none"> <li><b>Reviewer's Comment #1</b></li> </ul>	<p>The comments (editorial and conceptual) are ordered below in accordance with pagination of the report, as opposed to importance. Suggestions for punctuation are made in some cases to improve the clarity of the sentences.</p> <ul style="list-style-type: none"> <li>p. 3, section 1.2...add "of" to "majority <b>of</b> the constituents..."</li> </ul>	<ul style="list-style-type: none"> <li>Change made in Technical Report.</li> </ul>
3	<ul style="list-style-type: none"> <li><b>Reviewer's Comment #2</b></li> </ul>	<ul style="list-style-type: none"> <li>p. 6, section 2.1.2.3...add "one" to seven and <b>one</b> half miles..."</li> </ul>	<ul style="list-style-type: none"> <li>Change made in Technical Report.</li> </ul>
4	<ul style="list-style-type: none"> <li><b>Reviewer's Comment #3</b></li> </ul>	<ul style="list-style-type: none"> <li>p. 7, section 2.1.4...The presence of a Naval Air Weapons Station near the Mugu lagoon made me wonder about the possibility that the search of possible toxic agents should be expanded.</li> </ul>	<ul style="list-style-type: none"> <li>Future monitoring for sediment toxicity will include the lagoon.</li> </ul>
5	<ul style="list-style-type: none"> <li><b>Reviewer's Comment #4</b></li> </ul>	<ul style="list-style-type: none"> <li>p. 9, Table 2...I am sure the people who performed the toxicity tests are aware of the impact that relatively high levels of salts can</li> </ul>	<ul style="list-style-type: none"> <li>For monitoring conducted through the TMDL Work Plan, appropriate</li> </ul>

## Comments and Responses to Dr. Gregory Boardman

	Reviewer's Comment number	Comment	Response
		have on the results of the tests. But, the authors need to know what kinds of controls were used and that the controls in these experiments responded appropriately.	species were used when relatively high levels of salts were present. Only results for toxicity tests where controls were within guidelines were considered.
6	• <b>Reviewer's Comment #5</b>	• p. 10, Table 3...add "CaCO <sub>3</sub> " to Alkalinity (mg/L, <b>CaCO<sub>3</sub></b> )	• Change made in Technical Report.
7	• <b>Reviewer's Comment #6</b>	• p. 10, Table 3...is bicarbonate expressed as HCO <sub>3</sub> or CaCO <sub>3</sub> ? Add appropriate expression to units of mg/L.	• Bicarbonate is expressed as CaCO <sub>3</sub> , text clarified in Technical Report.
8	• <b>Reviewer's Comment #7</b>	• p. 14, Table 5...define all table headings at bottom of table.	• Change made in paragraph above table.
9	• <b>Reviewer's Comment #8</b>	• p. 16-22...series of references are given as superscripts. It was unclear to me where those references were. I would suggest replacing the superscripts with "author, year" and listing the references at the end of the report.	• Superscripts are used to present the listings as they are presented in the Water Quality Assessment Documentation which form the basis of the listing.
10	• <b>Reviewer's Comment #9</b>	• p. 16, section 2.3.1...replace "As" with "Because" and add a comma after lagoon in the last sentence.	• Change made in Technical Report.
11	• <b>Reviewer's Comment #10</b>	• p. 20, section 2.3.2...a TIE by Anderson <i>et al.</i> suggested diazinon was the cause of toxicity. This is one of a few statements where diazinon was implicated. How strongly did the results suggest diazinon was the agent? One begins to wonder at this point if a series of "suggested" results have defined the TMDL.	• It is the data presented in the Current Conditions Section (Section 3) which link diazinon to toxicity in the reach discussed here. Section 2 is used to present the listings as presented in the Water Quality Assessment Documentation which form the basis of the listing.
12	• <b>Reviewer's Comment #11</b>	• p. 21, section 2.3.3...were the only fish tested <i>Pimephales promelas</i> ? This is an area that can be strengthened in the future. More and different kinds of fish can be tested. Investigators might also look for vitellogenin in the fish which serves as an indirect measure of the exposure of the fish to a variety of chemicals (pesticides, various industrial agents, steroids).	• <i>Pimephales promelas</i> were the only fish tested in studies presented in the Water Quality Assessment Documentation which form the basis of the listing.
13	• <b>Reviewer's Comment #12</b>	• p. 25, section 3.1.1...I think readers will benefit from a rewrite of the following two sentences; "The non-detect levels are comparable to the maximum..." and "...and summary statistics can be directly calculated using fill-in values."	• Comment noted.

## Comments and Responses to Dr. Gregory Boardman

	Reviewer's Comment number	Comment	Response
14	• <b>Reviewer's Comment #13</b>	• p. 27, sections 3.1.1.1 and 3.2...suggest adding commas after “To develop summary statistics to characterize water quality in each reach,...” and “As part of a UCLA graduate study,...”	• Change made in Technical Report.
15	• <b>Reviewer's Comment #14</b>	• p. 28, section 3.2...suggest a semi-colon after “High mortality was observed at several stations;...”	• Change made in Technical Report.
16	• <b>Reviewer's Comment #15</b>	• p. 30, section on sediment toxicity...synergism is described as potentiating toxicity; there is actually a technical difference between synergism and potentiation. Potentiation is said to occur when an agent with no toxicity enhances the toxicity of another agent. However, there are those who do not recognize or are not concerned with the difference, so this may not be a problem.	• Comment noted
17	• <b>Reviewer's Comment #16</b>	• p. 30, section of sediment toxicity...I was surprised at the relatively high ammonia levels reported for a 96 hr LC50 (14.2-19.8 mg/L). What was the pH of these studies?	• Standard methods were followed including control of pH, but the precise pH value is not available..
18	• <b>Reviewer's Comment #17</b>	• p. 30, Table 16...add “in” after Prometryn.	• Change made in Technical Report.
19	• <b>Reviewer's Comment #18</b>	• p. 31, section on water toxicity...TIEs suggested volatile compounds were contributing to toxicity. The pesticides of concern are not very volatile, but volatilization is certainly a factor in the environmental fate of the pesticides. The section goes on to implicate chlorpyrifos and diazinon, but the volatile compounds statement makes one wonder if other agents need to be considered, at least in certain stream reaches/areas.	• Staff agrees that other agents do need to be considered. Future monitoring and TIEs will address any other constituents contributing to toxicity.
20	• <b>Reviewer's Comment #19</b>	• p. 31, section on water toxicity...define PBO.	• Change made in Technical Report.
21	• <b>Reviewer's Comment #20</b>	• p. 32, section on water toxicity...might be weakness to assume that prometryn and simazine cannot act synergistically with chlorpyrifos at the levels detected. How well was the threshold defined for synergism with atrazine?	• Monitoring and TIEs will address any other constituents such as prometryn and simazine which may act synergistically with identified toxicants.
22	• <b>Reviewer's Comment #21</b>	• p. 34, Table 18...add “in” to ammonia, prometryn and chlorpyrifos columns.	• Change made in Technical Report.
23	• <b>Reviewer's Comment #22</b>	• p. 36, section on water toxicity...stated that herbicides are “orders of magnitude lower” than levels identified as potentiating toxicity; seems misleading. Do you know the threshold levels that cause synergism? It might be better to indicate that the levels are certain factors (whatever they may be) lower than published values of	• Monitoring and TIEs will address any other constituents which may act synergistically with identified toxicants.

## Comments and Responses to Dr. Gregory Boardman

	Reviewer's Comment number	Comment	Response
		concern (see comment 20).	
24	• <b>Reviewer's Comment #23</b>	<ul style="list-style-type: none"> <li>p. 36, section on water toxicity...again, the suggestion here is that the TIEs do not suggest toxicity is due to the herbicides alone; see comment 18.</li> </ul>	<ul style="list-style-type: none"> <li>The TIE data support toxicity due to chlorpyrifos and diazinon. Monitoring and Toxicity Identification Evaluations (TIEs) will address any other constituents which may act synergistically with identified toxicants.</li> </ul>
25	• <b>Reviewer's Comment #24</b>	<ul style="list-style-type: none"> <li>p. 40, Table 24...add "in" after Ammonia in constituent column.</li> </ul>	<ul style="list-style-type: none"> <li>Change made in Technical Report.</li> </ul>
26	• <b>Reviewer's Comment #25</b>	<ul style="list-style-type: none"> <li>p. 44, section 3.3...good to see future monitoring will continue for the triazines and synergistic effects.</li> </ul>	<ul style="list-style-type: none"> <li>Staff agree.</li> </ul>
27	• <b>Reviewer's Comment #26</b>	<ul style="list-style-type: none"> <li>p. 46, Figure 2...typo on spacing of "with" in caption.</li> </ul>	<ul style="list-style-type: none"> <li>Correction made in Technical Report.</li> </ul>
28	• <b>Reviewer's Comment #27</b>	<ul style="list-style-type: none"> <li>p. 48, section 4.1...good to see new ammonia targets will be developed if necessary.</li> </ul>	<ul style="list-style-type: none"> <li>Staff agree.</li> </ul>
29	• <b>Reviewer's Comment #28</b>	<ul style="list-style-type: none"> <li>p. 49, 50, Table 32 and table on p. 50 (should be Table 33)...acute and chronic criteria for chlorpyrifos in saltwater have been transposed. Acute CDFG target for saltwater is 0.02 ug/L and chronic CDFG target for saltwater is 0.009 ug/L. This error is made in table on p. 50 (see correct nos. in Table 32) and on page 2 of Attachment A to Resolution No. R4-2005-XXXX under numeric targets.</li> </ul>	<ul style="list-style-type: none"> <li>Change made in Technical Report.</li> </ul>
30	• <b>Reviewer's Comment #29</b>	<ul style="list-style-type: none"> <li>p. 52, section 4.3.2...<math>k_{ow}</math> and <math>K_{oc}</math> for diazinon are reasonable.</li> </ul>	<ul style="list-style-type: none"> <li>Staff agree.</li> </ul>
31	• <b>Reviewer's Comment #30</b>	<ul style="list-style-type: none"> <li>p. 55, section 4.5... "Table 34" at end of sentence is in smaller font.</li> </ul>	<ul style="list-style-type: none"> <li>Change made in Technical Report.</li> </ul>
32	• <b>Reviewer's Comment #31</b>	<ul style="list-style-type: none"> <li>p. 56, section 5.1.2.1...add comma after "...by land use site,..."</li> </ul>	<ul style="list-style-type: none"> <li>Change made in Technical Report.</li> </ul>
33	• <b>Reviewer's Comment #32</b>	<ul style="list-style-type: none"> <li>p. 60, 61, Figures 6 and 7...hard to evaluate land use maps in black and white; will need color pages here for certain audiences.</li> </ul>	<ul style="list-style-type: none"> <li>Comment noted.</li> </ul>
34	• <b>Reviewer's Comment #33</b>	<ul style="list-style-type: none"> <li>p. 62, section 5.3.2...clear that progress is being made in managing the pesticides and will be made in refining the TMDL.</li> </ul>	<ul style="list-style-type: none"> <li>Staff agree.</li> </ul>
35	• <b>Reviewer's Comment #34</b>	<ul style="list-style-type: none"> <li>p. 66, 67, Figures 10 and 11...same comment as in 31.</li> </ul>	<ul style="list-style-type: none"> <li>Change made in Technical Report.</li> </ul>
36	• <b>Reviewer's Comment #35</b>	<ul style="list-style-type: none"> <li>p. 72, section 5.3.4...it is written that 15 golf courses "did not report use of notable amounts of the constituents". How much did they report? What would be notable?</li> </ul>	<ul style="list-style-type: none"> <li>Comment noted.</li> </ul>

## Comments and Responses to Dr. Gregory Boardman

	Reviewer's Comment number	Comment	Response
37	• Reviewer's Comment #36	• p. 73, section 5.3.4.2...add "in 2000" after 15,123 pounds.	• Change made in Technical Report.
38	• Reviewer's Comment #37	• p. 73, 74, Tables 43 and 44...define AI in "pounds AI".	• Change made in Technical Report.
39	• Reviewer's Comment #38	• p. 79, section 5.3.6...were toxicity tests performed on the POTW effluents?	• Yes.
40	• Reviewer's Comment #39	• p. 79, section 5.3.7...interesting, important and correct statements about the solubility and distribution of chlorpyrifos and diazinon.	• Staff agree.
41	• Reviewer's Comment #40	• p. 80, section 5.3.8...good that more information is being collected by SCCWRP to evaluate the impact of atmospheric deposition.	• Staff agree.
42	• Reviewer's Comment #41	• p. 94, section 6.4.4...what first-order rate constant was used for microbial and hydrolysis reactions? At what point would they be significant with respect to hydrologic movement? Was sorption to particulates considered?	• Detailed information on the subwatershed outflows is included in Attachment A: Linkage Analysis provided with the Technical Report.
43	• Reviewer's Comment #42	• p. 95, section 6.4.5...this probably answers comment 40; no distinction was made between dissolved and particulate fractions, and transfer between the water and sediments was not considered. It seems that while the first assumption is conservative (as noted), the latter regarding the water:sediment interface is not conservative and may be an important factor to consider.	• Staff agree.
44	• Reviewer's Comment #43	• p. 95, section 6.5.1...the Henrys' coefficients are reasonable.	• Staff agree.
45	• Reviewer's Comment #44	• p. 96, section 6.5.2...are these first order coefficients the answers to my question in comment 40? If so, the reader could be referred to this section from section 6.4.4.	• Yes.
46	• Reviewer's Comment #45	• p. 96, section 6.5.3... $k_{ow}$ s and $k_{oc}$ s are reasonable.	• Staff agree.
47	• Reviewer's Comment #46	• p. 97, section 6.5.4...appears that better tracking of the pesticides in the air will be an important area to refine.	• Staff agree.
48	• Reviewer's Comment #47	• p. 99, Figure 29...should each of the y-axes on the right side graphs be "diazinon concentration"?	• No, the chlorpyrifos and diazinon graphs are separate.
49	• Reviewer's Comment #48	• p. 101, section 6.6.8...atmospheric drift was not considered in the TTMBM (correct?), so it could not be considered in the sensitivity analysis. Thus, I think the last sentence of the first paragraph is a bit misleading.	• Correct. Change made in Technical Report.
50	• Reviewer's Comment #49	• However, given the insensitivity of the model, it seems that the basic structure of the model and the various assumptions need to	• Comment noted.

## Comments and Responses to Dr. Gregory Boardman

	Reviewer's Comment number	Comment	Response
		now be reviewed; i.e., the authors need to now quantitatively consider whether the current limitations recognized can sufficiently improve the results within the matrix of the model.	
51	• <b>Reviewer's Comment #50</b>	<ul style="list-style-type: none"> <li>• p. 109, section 7.3.3...it is stated here that the sale of diazinon for non-agricultural uses will terminate in December 2004. On page 72, the authors indicate that neither chlorpyrifos and diazinon will be sold for non-agricultural uses by December 2005. The statements are consistent, but it seems important for the readers to understand throughout the report that the deadline for the non-agricultural ban on diazinon has occurred and is a year before the ban on chlorpyrifos.</li> </ul>	<ul style="list-style-type: none"> <li>• Staff agree.</li> </ul>
52	• <b>Reviewer's Comment #51</b>	<ul style="list-style-type: none"> <li>• p. 112, section 7.4...the value of output from the TTMBM is questionable, but the results are being used to set reductions.</li> </ul>	<ul style="list-style-type: none"> <li>• Allocations are set to the water quality criteria based numeric targets. The results of the TTMBM model are used only to estimate the reductions needed to meet allocations.</li> </ul>
53	• <b>Reviewer's Comment #52</b>	<ul style="list-style-type: none"> <li>• p. 113, Figure 32...Figure 32 does not have a heading or number; and, the y-axis is not labeled.</li> </ul>	<ul style="list-style-type: none"> <li>• The heading and y-axis of Figure 32 will now print correctly.</li> </ul>
54	• <b>Reviewer's Comment #53</b>	<ul style="list-style-type: none"> <li>• p. 113, Figure 33...was there to be a graph in the large white box to the right of the three columns of data? Perhaps just my copy is incomplete?</li> </ul>	<ul style="list-style-type: none"> <li>• The Technical Report includes a graph to the right of the three columns.</li> </ul>
55	• <b>Reviewer's Comment #54</b>	<ul style="list-style-type: none"> <li>• p. 115, Figure 34...again, black and white print makes the figure difficult to interpret, so others may need a color copy.</li> </ul>	<ul style="list-style-type: none"> <li>• Comment noted.</li> </ul>
56	• <b>Reviewer's Comment #55</b>	<ul style="list-style-type: none"> <li>• p. 116, section 7.6.2...last paragraph of the section makes a strong addition to the TMDL.</li> </ul>	<ul style="list-style-type: none"> <li>• Comment noted.</li> </ul>
57	• <b>Reviewer's Comment #56</b>	<ul style="list-style-type: none"> <li>• p. 117, section 8...I strongly agree with the basic concepts of the implementation plan.</li> </ul>	<ul style="list-style-type: none"> <li>• Comment noted.</li> </ul>
58	• <b>Reviewer's Comment #57</b>	<ul style="list-style-type: none"> <li>• p. 122, section 8.5.1...evaluating compliance with numeric targets will be extremely useful if the results can be linked to toxicity and residual (fish tissue and sediments) tests. It does not seem that enough emphasis is being placed on sediment and fish analyses; i.e., the water data will far outweigh the sediment and fish results, which will weaken the linkages.</li> </ul>	<ul style="list-style-type: none"> <li>• The monitoring plan will include sediment and fish tissue components.</li> </ul>
59	• <b>Reviewer's Comment #58</b>	<ul style="list-style-type: none"> <li>• p. 126, section 8.7...adaptive management is key to the success of the TMDL process.</li> </ul>	<ul style="list-style-type: none"> <li>• Staff agree.</li> </ul>

## Comments and Responses to Dr. Gregory Boardman

	Reviewer's Comment number	Comment	Response
60	<ul style="list-style-type: none"> <li><b>Reviewer's Comment #59</b></li> </ul>	<ul style="list-style-type: none"> <li>p. 141, NAWS and NBVC Studies...was not sure how to interpret the following sentence: "...based on the results provided in the study reports, it was not possible to determine which sites showed toxicity when compared to test control organisms." Are the results meaningful?</li> </ul>	<ul style="list-style-type: none"> <li>The results are meaningful but not conclusive because control sites selected may have been contaminated and the substrate of the sites were not typical of the tests species. These issues are considered in future monitoring.</li> </ul>
61	<ul style="list-style-type: none"> <li><b>Reviewer's Comment #60</b></li> </ul>	<ul style="list-style-type: none"> <li>p. 141, NAWS and NBVC Studies... "surficial (?) samples collected..."</li> </ul>	<ul style="list-style-type: none"> <li>The term surficial refers to the portion of the sediment at the surface of the sample, in this case from the top two cm..</li> </ul>
62	<ul style="list-style-type: none"> <li><b>Reviewer's Comment #61</b></li> </ul>	<ul style="list-style-type: none"> <li>pp. 144-146, BPTCP through conclusions...It appears that there are other potential, chemical (organic and inorganic) culprits. This is not surprising given the past and current activities in the watershed. In any event, as mentioned above, the value of this TMDL should be apparent in the near future. And, several of the strategies outlined in the implementation plan should help to ameliorate the impact of various agents in addition to those addressed in the TMDL. (By the way, there is a typo of NAWS in heading on p. 144.)</li> </ul>	<ul style="list-style-type: none"> <li>Change made in the Technical Report.</li> </ul>

**Calleguas Creek its Tributaries and Mugu Lagoon Toxicity, Chlorpyrifos and Diazinon TMDL**

**Response to Technical Review of Dr. Mel Suffet, Environmental Science and Engineering Program, UCLA, dated May 11, 2005**

	<b>Reviewers Comment number</b>	<b>Comment</b>	<b>Response</b>
1	<b>Reviewer's General Comments #1</b>	An executive summary and recommendations section is essential for the TMDL Report.	The "Executive Summary" in the Board package acts as an executive summary and the Implementation Plan contains the recommendations.
2	<b>Reviewer's General Comments #2</b>	Stakeholders and their affiliations should be listed in an Appendix. Authors of the report should be listed by sections prepared or as a list in the Appendix.	Staff agree. Stakeholders and their affiliations are discussed in the Staff Memo accompanying this TMDL Technical Report.
3	<b>Reviewer's General Comments #3</b>	The word "analysis" is used to mean, "evaluate", and this should be changed to the word "evaluate" where appropriate in the report.	Comment noted, but no changes made in the Technical Report.
4	<b>Reviewer's General Comments #4</b>	Section 2 of the report, "Problem Statement", makes the argument that direct measurement of the Organophosphate Pesticides (OPs) and not "ambient water column toxicity" should be used as the basis of the TMDL. This needs to be highlighted in the report as a major conclusion. The reviewer agrees with this.	The TMDL uses both organophosphate toxicity and water column toxicity as a basis for the TMDL.
5	<b>Reviewer's Major Critique 1</b>  <b>Section 2, Section 3.3</b>	<b>Organophosphate insecticides (OPs)</b> share a primary mode of biological action, acetylcholinesterase inhibition. Thus, a relative potency factor (RPF) approach should be used to estimate the cumulative potential toxicity of OPs and should be used to develop the TMDL, along with specific OPs, if desired.	Staff understand that organophosphate insecticides have a common mode of action. The RPF approach is a valid method for estimating the cumulative potential toxicity of OPs. However, in this TMDL, the approach chosen for setting targets was appropriate given 1) cumulative toxicity with regards to OPs

	Reviewers Comment number	Comment	Response
			was not identified through sampling and 2) diazinon and chlorpyrifos were the only OPs identified as contributing to toxicity and as such targets were set for only these OPs. In addition, a standardized approach to implementing RPF targets has not been developed for use in a regulatory setting.
6		In the reviewer's opinion, the comment in Section 2 about chlorpyrifos applies to all the organophosphate pesticides and should be stated clearly. How do the authors know if it is chlorpyrifos rather than a combination of organophosphates that is causing the toxicity? The mechanism of biological action of all the organophosphate pesticides is the same. Thus, the TMDL should be based upon an accepted chemical analysis of all organophosphate pesticides. There are accepted EPA analytical methods that determine most if not all organophosphate pesticides simultaneously including chlorpyrifos and diazinon.	<p>The purpose of the section is to present the data that form the basis of the listings. The data used to form the basis for the listings did not consider whether combinations of OPs were causing toxicity. As such, no discussion on combinations is presented in Section 2.</p> <p>In addition, in Section 3.2, the Technical Report presents data relevant to the identified toxicants. In any samples for which TIEs were performed, all potential toxicants are discussed in text. These potential toxicants would include any combination of OPs.</p>
7		There is an accepted peer reviewed literature on the toxicity of organophosphorus insecticides demonstrating that OPs share a primary mode of biological action, acetylcholinesterase inhibition. Thus, a relative potency factor approach should be used to estimate their potential toxicity and should be used to develop the TMDL. In the RPF approach, each organophosphate chemical is assigned a	See response to comment 5, above.

	Reviewers Comment number	Comment	Response
		potency factor relative to a reference compound. This approach is completely defined with literature references in Chapter 3 of the 2001, UCLA thesis under my mentorship by Dr. Joel Pedersen (see attached). There appears no reason why this approach was not considered and adopted as it fits the spirit of the TMDL approach presented in Chapter 2.	
8		There is a secondary reason to consider this approach. If diazinon and chlorpyrifos are the only OPs regulated, the funds to develop this TMDL will be wasted as EPA is phasing out the use of diazinon and chlorpyrifos and other OPs could be substituted instead. This is discussed in Section 5.3, of the report but not acted upon.	Chlorpyrifos and diazinon are phased out only for urban uses and are still used in agriculture. The TMDL Implementation Plan will continue to monitor toxicity loads as diazinon and chlorpyrifos are phased out and substitute pesticides come into use.
9		In Section 3.3, Additive/Synergistic Toxicity, the authors show the peer review literature that agrees with the above approach for chlorpyrifos and diazinon. Further, the authors acknowledge that OPs share a primary mode of biological action, namely, acetylcholinesterase inhibition. However, the authors disregard these findings as they discuss other causes of toxicity including triazine herbicides instead of separating the discussion of the OPs from the triazines as they should have.	The Technical Report presents a discussion based on the findings of toxicity studies completed in the CCW which does not disregard findings of additive toxicity between OPs. However, the only evidence in the available studies concerning additive or synergistic toxic effects was the potential additive toxicity between ammonia and chlorpyrifos in sediment and no data in the CCW indicated additive OP toxicity. As such, it was appropriate to discuss the potential for synergistic effects between OPs and triazines.
10		Section 3.3. Additive/Synergistic Toxicity and Table 2.1 on p. 36	See response to comment 5, above.

	Reviewers Comment number	Comment	Response
		raises the issue of the combined toxicity of OPs and other chemicals such as triazine herbicides (atrazine, simazine etc). To the best of the reviewer's knowledge, the treatment of the additive/synergistic toxicity of different chemicals exhibiting multiple modes of toxicity is unresolved at present in the peer-reviewed literature. The reviewer agrees that the combined effects of triazines and OP warrants further research and is not yet applicable for a TMDL. However, the combined toxicity of all the OPs should be considered using a RPF approach. The dissolved fraction of OPs are the most likely to exert toxic effects on aquatic organisms. This should be a part of the executive summary as well in a shortened form as it summarizes how TMDL were developed.	
11		P22. Para. 2 states that the analytical chemistry data are available for chlorpyrifos and diazinon. The data for all the other OPs should be available and included in the relative potency factor approach. The same analytical methods used for chlorpyrifos and diazinon are used for most other OPs.	The data for all OPs were available and were considered in the TMDL analysis. Chlorpyrifos and diazinon were the only OPs identified as contributing to toxicity in the CCW.
12	<b>Major Critique 2. Data Base: Whole sample data vs. data of separate analysis of dissolved and suspended solids 6. Section 3.1.1.1 para 1.</b>	Whole sample data are flawed as the amount of suspended solids present in a sample can strongly influence the results. If the chemical of concern is well adsorbed by the suspended solids, higher concentrations of the chemical will be determined when the suspended solids content is higher. A proper analysis would include the determination of concentrations of soluble pollutant, the suspended solids-associated pollutant and suspended solids themselves. If needed, the correct whole sample concentration per liter then can be calculated. Chapter 3 of the 2001, UCLA thesis under my mentorship by Dr. Joel Pedersen (see attached) shows that on average 45% of chlorpyrifos and 14 % of diazinon are in the suspended solids phase in agricultural runoff. The theoretical	While staff agree that it is important to analyze water column, TSS and settleable solids separately to better understand the source, fate and effect of the pollutants discharged, the available criteria are for total concentrations. Therefore, it is appropriate to consider total concentrations when determining compliance with available criteria. The concentration of suspended solids can affect the total concentrations and the TMDL monitoring plan calls for the

	Reviewers Comment number	Comment	Response
		underpinnings for this are described in the Modeling Section 6.5 of the report on pages 93-94. Thus, the total concentration of chlorpyrifos would be significantly affected by the amount of suspended solids in each sample. This needs discussion in the document especially for future TMDL monitoring and development of best management practice.	determination of soluble and suspended solids-associated pollutants during storm conditions. As in-stream values of TSS are typically low during non-storm conditions, a separate determination during these conditions is unnecessary. It should be noted, Pedersen's work focused primarily on agricultural runoff. In general, agricultural runoff is higher in TSS and is generally not representative of in-stream conditions.
13		The amount of suspended solids collected in a sample is affected by ambient environmental conditions at the sampling location. For example, depending on whether a sample is collected after a storm, downstream from the discharge point of a field during an irrigation event or under quiescent conditions, different amounts of suspended solids will be present in the sample. The sampling location in the stream will also affect the amount of suspended solids collected. Is the sample taken at the bank, in midstream in the top layer, in midstream near the bottom, etc.? Is the sample integrated by depth or flow or time composite? The objective of taking the sample should determine the type of sample to take. Therefore, the total suspended solids should be reported for each sample taken as should the type of sample (grab or composite), the location of the sampling point in the stream and the stream condition.	Suspended solids will be collected as part of the TMDL monitoring program. The monitoring plan will specify the numbers, types and relative location of samples to obtain representative characteristics of pollutant loadings in Calluguas Creek and in Mugu Lagoon.
14		Section 3.1 Uses of Data. The present database for chlorpyrifos and diazinon is shown in Table 12. An Appendix of all data in Table 12 that is used in the report is needed for those interested. In other words, the specific data for Tables 13-31 are needed. This could be	Data will be presented in an Excel workbook as part of the administrative record. The data will contain information as to how the samples were collected.

	Reviewers Comment number	Comment	Response
		in the form of a CD. Information about how the samples were collected should be included as well. In toto, the samples that have been separated into aqueous and suspended solids phases should be given more weight.	
15	<b>Major Critique 3 Data Base Usage Decisions - The decision to use grab and composite data as equivalent for flowing stream evaluation. Section 3.1.1</b>	<p>The data from each stream reach is aggregated to determine characteristic concentrations in that part of the stream. The database is a set of data taken during many different studies with different study goals. This reviewer has assumed that the TMDL must be done by law and thus, this has to be based upon this available knowledge.</p> <p>The data base treats grab samples and composite samples as equivalent (P25. Para 2). Grab samples have much higher variability as they are dependent upon stream conditions, such as flow and suspended solids content. Composite samples better represent average concentrations of chemicals in a stream and are more reasonable for TMDLs development in the reviewer's opinion. Flow composite samples should be given more weight in the evaluation because they better depict average environmental conditions of the streams. The authors should endeavor to do this.</p>	Staff agree that grab samples tend to be more variable. However, given the limited amount of data it was necessary to make some simplifying assumptions to conduct data analysis. If sufficient data is available, future analyses for TMDLs may consider an approach that gives more weight to samples that have been separated into water column, TSS and settleable solid fractions and composite samples over grab samples.
16		<p>Tables 14-28 could be better presented as box and whisker data plots to show variability and the composite samples noted and compared to the grab samples under the author's assumption of a log normal data distribution.</p> <p>The authors implicitly assume that the average of the grab samples would approximate an average value. Apparently, if the authors did not do this, they would not have sufficient data to develop an average value. They should state this method of approach clearly in the introduction, and discussion for Section 3 and in the executive summary of the document. However, to restate: Tables 14-</p>	Box and whisker plots are a convenient way to present summary data including variability, however, the summary statistics and variability in the data in Tables 14 - 28 is adequately expressed by presenting the mean, median, and standard deviation.

Comments and Responses to Dr. Mel Suffit

	Reviewers Comment number	Comment	Response
		<p>28 could better be presented as box and whisker data plots to show the variability of the data and the composite samples noted and compared to the grab samples. A statistical comparison of composite vs. grab samples would be justified. Flow composite sampling should be stated as the goal for future analyses.</p> <p>The authors assume the environmental data follows a log normal distribution in Section 3.1.1. Grab samples can be from any one point in the distribution. However, Tables 14-28 show a mean <math>\pm</math> standard deviation of the data which does not describe a log normal data distribution. The box and whisker plot would best describe the data and then the data should be evaluated in terms of a log normal distribution and its average value, the geometric mean.</p>	
17		<p>The Censored Data discussion in Section 3.1.1, (P. 24-25) describes removing high level non-detect data. The authors should reconsider this after reading the attach paper submitted for publication from work completed at the LA Water Board with the reviewer. "H. Park et al., submitted to Environmental Science and Technology, 2005".</p>	<p>Staff find that the approach to removing high level non-detect data was appropriate. The issues in the Park <i>et al.</i> paper were also discussed thoroughly in the work completed by Shumway <i>et al.</i>, and the Helsel, Gilliom, and Cohn which were evaluated in the development of this TMDL. As further appropriate statistical methods are developed they will be considered for future analysis.</p>
18		<p>Section 5.1.2 Source Analysis - The summary statistics proposed are exactly the same as used in Section 3.1.1. The two types of source input are non-point source runoff listed in Table 36 and point source runoff from treatment plants. The data are evaluated in a consistent manner with Section 3.1.1 for Treatment Plant Effluent by using grab samples of effluent. Point source runoff from treatment plants can be directly compared with a stream sample, as both are</p>	<p>See response to comment 15, above.</p>

	Reviewers Comment number	Comment	Response
		continuous flowing streams. As argued above, it would be best to complete flow composite analysis. In fact, that would be recommended for all future sampling. All of the criticism presented above applies as well for point source samples including data presentation. Non-point source runoff is evaluated in General Comment 8. In toto, composite samples should be given more weight.	
19	<b>Major Critique 4. Data Base Usage Decisions - The decision to use grab and composite data as equivalent for non-point source runoff data Sections 5.1.1. and 5.3.3.2</b>	<p>This reviewer does not think that grab sample data can be evaluated properly for non-point source runoff such as from agriculture or urban land. In Chapters 3, 4 and 5 of Joel Pedersen 2001, UCLA thesis, under my mentorship, (attached) Joel and many other authors in the literature measure “Event Mean Concentration” (EMC) for non-point source runoff as the episodic and diffuse nature of surface runoff makes it difficult to quantify average mass load contributions of pollutants during a storm or irrigation event for agricultural or urban runoff. The EMC is a flow-weighted average (flow-weighted composite) concentration defined as the ratio of the event pollution load to total event runoff volume.</p> <p>There are no papers in the peer reviewed literature that this reviewer is aware of where an evaluation has been made of the optimum time to take a grab sample that represents the EMC of a runoff event. Thus, grab sample analyses of a storm or irrigation event cannot give you average values. For example, agricultural and residential runoff data shown by Pedersen’s thesis that EMCs for chlorpyrifos and diazinon in irrigation water from crops varied over 2 to 4 orders of magnitude. Residential runoff varied over 10 orders of magnitude. The magnitude of the agriculture and urban runoff was about the same, indicating that residential land use is important. The EMC should be used to compare sites. Figures 12 and 13 should be from EMCs and not grab sample data as described above. Figure</p>	Staff agree that EMCs are an appropriate method for evaluating non-point source loading. However, given the limited amount of data available it was necessary to make some simplifying assumptions to conduct data analysis. Future analysis for TMDLs may consider an approach that includes developing EMCs.

	Reviewers Comment number	Comment	Response
		14 is a log normal plot based upon grab samples. This plot should again be from EMCs for the reasons discussed above. If one assumes a worst case scenario that the grab samples represent low values of EMCs, the plot still shows that 75% of the data are above the chronic criteria of 15 ng/L for diazinon. The authors concerns about total sample analysis and not separating suspended solids and aqueous phase concentrations as described above remain as a problem.	
20	<b>Reviewer's Specific Comments about the Document</b> <u>Section 2</u> , "Problem Statement" - Specific Comments About Section 2	P.5. References for 2.1 Para 2 last two lines are needed.	The reference is the California Department of Water Resources (2000). The full citation is included in the Technical Report References section.
21		<b>P.7.</b> Before 2.1.4 – How is the agricultural drainage water and industrial wastewater drainage transported to Mugu Lagoon and estuary? This should be stated in the report.	Section 2.1.4 describes the water transport to Mugu Lagoon. Two of these ditches, Oxnard drainage ditches 2 and 3, discharge urban and agricultural runoff originating beyond the Station's boundaries into the central and western portion of the lagoon. The remaining ditches discharge urban and industrial runoff originating on the Station.
22		<b>P.7.</b> 2.1.5 end of sentence 1 – add -- a Mediterranean climate.	Change made in the Technical Report.
23		<b>P.8.</b> The last paragraph – Table 2 needs clarification. The units of the parameters are missing. First, the range of general water quality characteristics for surface water in general from all the locations in	The data are presented as means to communicate the variability in conditions in the watershed. All available data were

	Reviewers Comment number	Comment	Response
		the area has no meaning for any specific situation especially if the data has more points for location x versus y and z. How were data chosen for the table? What criteria were used? What are the references for this data? The data are too variable for a table like this. It can be said that the variability of the surface water flow and water quality data are very large because of wet vs. dry season, effluent dominated streams, rain events, etc.	used and included in the Excel database provided with the TMDL. Units have been added to Table 2 in the Technical Report.
24		<b>Table 2a-x</b> - A more meaningful Table 2a-x would be from USGS gauging stations on the streams. Stream data are available at specific stream sampling locations for base flow and storm flow. Also, dry season vs. wet season data should be compared. Average values for ephemeral streams lack meaning. The USGS hydraulic flow data at the locations should be included. This would also be good for Mugu Lagoon at tidal sites. The main streams for this watershed are described in section 2.1.6. Another approach could be to define the water quality by stream reach and season.	USGS gauging data is useful data. However, Staff feels that, in this introductory section, the general water quality data provided is sufficient to describe the waterbodies.
25		In contrast to Table 2, Table 3 the groundwater characteristics shows consistent basin-wide water quality characteristics. What was the database for this table? Chloride would be an interesting parameter to include here because of the brine line. The comment on conductivity variability is countered by the other data in the table and should be checked. How were the data chosen for this table? This should be stated.	The data for Table 3 came from the Calleguas Creek Watershed database.
26		<b>Section 2.1.10</b> on Reach Designation – The water quality of each reach can be added instead of using Table 2. Also, a base flow could be added for each reach. Footnote for Table 4 - Define WRP, POTW, etc from notes. The yearly base flow and average flow per day in the wet and dry seasons should be added to the note right	The definitions of WRP, POTW, etc. are now included in the Technical Report.

	Reviewers Comment number	Comment	Response
		after the name of the plant.	
27		<b>Table 5.</b> All of the codes used need to be placed in the footnotes, so someone can understand the table. At present, it is not readable. I can only guess at some codes. Also, each of the beneficial uses come from some EPA list. That list should be referenced and commented upon.	The codes are now included in text preceding Table 5 in the Technical Report.
28		<b>2.3 Basis for Listing</b> – The authors realized the futility of the use of a TMDL for water column toxicity. The reviewer wholeheartedly agrees as described in general comment 1.	Section 2.3 reviews the data used for inclusion of the waterbodies on the 303(d) list and does NOT state or imply futility in using toxicity as the basis for a TMDL. Water column toxicity is used as a basis for the TMDL.
29		<b>2.4 Problem Statement Summary</b> is not a summary. Besides an explanation of Table 11 (a repeat of Table 1), the summary should state the key conclusion presented in Sections 2.3 and 2.4 that the TMDL will focus on measurement of organophosphorus pesticides and not “Ambient Water Column Toxicity” and justify why. This is a key point of the TMDL development and the reviewer agrees with the scientific validity of the conclusion. However, the point is buried in Section 2.3 and 2.4 without emphasis. It needs highlighting in the report conclusions and executive summary.	Table 11 is intended to summarize the 303(d) listings addressed by the TMDL. As such, it is a repeat of Table 1. The TMDL will focus on both organophosphorus pesticides and water column toxicity.
30		<u>Section 3. Current Conditions.</u> <b>In the introduction to this section a paragraph that generally shows the plan of evaluating the stream reaches should be presented.</b>	The introductory paragraph does provide a general approach to the Current Conditions section.
31		<b>P22. Para. 2</b> states that the analytical chemistry data are available for chlorpyrifos and diazinon. The data for all the other OPs should	See response to comment 5, above.

Comments and Responses to Dr. Mel Suffit

	Reviewers Comment number	Comment	Response
		be available and included, as the relative potency factor approach presented in general comment 4 should be developed. The same analytical methods used for chlorpyrifos and diazinon are used for most other OPs.	
32		<b>Section 3.2 Sediment Toxicity.</b> The authors showed very little data about sediment toxicity. However, the bioavailability of the pollutant via pore water was indicated as potential approach in the future. More data are needed to evaluate the situation. This consideration should be addressed in the document and future studies.	Staff agrees more data are needed. As presented in the Monitoring Plan, additional sediment toxicity and chemistry data will be collected as part of the Implementation Plan.
33		The potential sources of pesticides should be stated and as the data unfolds the waste treatment plant discharges (from homes and industry), industrial sources and agricultural sources should be specified, as they are known. The question of the effect of suspended solids and sediment on the approach to toxicity and how to obtain correct data for the evaluation and implementation of the approach are discussed in other sections of the critique.	Potential sources of pesticides are discussed in the Source Analysis section.
34		<b>Section 3.4 and 3.5 Water and Sediment Toxicity Summary.</b> A more complete summary should be written including the above comments. Finally a summary table at the end of the Section 3 is needed. The table can draw upon Table 29 and indicates conclusions for each reach and the potential causes and needs for TMDLs. This table should be part of executive summary as well. The summary should include a discussion of the problems of using TIEs e.g., Table 31. Possibly, a picture of the stream and reaches showing successively with a box and whisker plot of concentration of OPs could put the watershed in the perspective.	Table 31 provides summary information of the potential causes of toxicity based on the information provided throughout the Current Conditions section.

	Reviewers Comment number	Comment	Response												
35		<p><b>Section 4. Numeric Targets</b></p> <p>As stated above, the mechanism of biological action of all the organophosphate pesticides is the same. This is the first key disagreement of this reviewer with the scientific validity of author’s conclusions. Thus, the TMDL should be based upon an accepted chemical analysis of all organophosphate pesticides.</p>	See response to comment 5, above.												
36		<p><b>Section 4.3.1 and 4.3.2 OP Targets</b></p> <p>The authors chose water quality criteria developed by other government agencies to develop the numeric target for each pesticide in fresh and salt water. The reviewer read the documents that developed the choices for the Chronic Levels of Toxicity chosen and fined them to be acceptable. The criteria chosen as shown in the Footnote of all Tables need to be justified in the document and the source of the data properly referenced. This is the basis of the TMDL. Why was this criteria chosen over other criteria? Chapter 3 of the UCLA thesis under my mentorship by Dr. Joel Pedersen chose acute toxicity only for dissolved OPs. The values are compared below for reference.</p> <table><tr><td>1 TMDL –Water Board</td><td>(Total - ng/L)</td><td>100</td></tr><tr><td>14 Chronic – documents</td><td></td><td></td></tr><tr><td>2. Table 3.3 Pedersen Thesis* (Dissolved - ng/L)</td><td>200</td><td></td></tr><tr><td>38 96-hr LC 50 (Acute)</td><td></td><td></td></tr></table> <p>*Thesis – Chapter 3, Table 3.3.</p> <p>Three approaches are different in the TMDL development by 1 and 2 above.</p>	1 TMDL –Water Board	(Total - ng/L)	100	14 Chronic – documents			2. Table 3.3 Pedersen Thesis* (Dissolved - ng/L)	200		38 96-hr LC 50 (Acute)			An explanation of which targets were considered and how the final targets were chosen is presented in the Numeric Targets section. The sources that form the basis for choosing the final target are found in section numbers 4.3 and 4.4. The criteria suggested by the reviewer have not gone through a formal review process and are based on a single LC50 value.
1 TMDL –Water Board	(Total - ng/L)	100													
14 Chronic – documents															
2. Table 3.3 Pedersen Thesis* (Dissolved - ng/L)	200														
38 96-hr LC 50 (Acute)															
37		<p>1. Dissolved only vs. total concentration. Pedersen’s is less conservative as only dissolved phase concentrations are used. This is important especially for chlorpyrifos as it was shown in the study to</p>	Staff agree that dissolved criteria may be more appropriate for addressing bioavailable chemicals. However,												

Comments and Responses to Dr. Mel Suffit

	Reviewers Comment number	Comment	Response
		average 46 % in suspended solid phase at equilibrium with the water phase. The dissolved criteria for stream water, the reviewer feels is best as the chemical must be soluble to be bioavailable.	accepted criteria are as total concentrations, and as chlorpyrifos has been found to contribute to sediment toxicity the sediment associated component can not be ignored.
38		2. Choice of criteria for toxicity. Pedersen's is less conservative as chose 96-hr LC 50 (Acute), vs. chronic values of the TMDL document. That is fine. The toxicity criteria is the authors choice.	Staff agree.
39		<p>3. A "relative potency factor" approach is used to estimate potential toxicity of OPs by Pedersen.</p> <p>The reviewer takes exception to the authors choice of individual levels alone for OPs and feels strongly that the "relative potency factor" approach can be used to estimate total potential toxicity of OPs. A combination of individual OPs and a Total Toxicity of OPs would also be acceptable.</p> <p>The numeric targets for chlorpyrifos and diazinon on P. 49 and 51, respectively should be evaluated by a toxicologist. However, an estimate potential toxicity of all OPs should be developed by using relative potency factors as per Chapter 3 of the 2001, UCLA thesis under my mentorship by Dr. Joel Pedersen.</p>	See response to comment 5, above.
40		<b>Summary Section for Section 4.</b> A summary section for section 4 is needed. None is presented.	Comment noted.
41		<b>Section 4.4 and 4.5 Water and Sediment Toxicity Target.</b> This section seems strange after the authors have stated clearly that this is a poor approach for hazard. Section 2 of the report, "Problem Statement", makes the argument that direct measurement of the	Water column toxicity targets are included to provide a method for triggering future investigations of the causes of toxicity.

Comments and Responses to Dr. Mel Suffit

	Reviewers Comment number	Comment	Response
		Organophosphate Pesticides (OPs) and not “ambient water column toxicity” should be used as the basis of the TMDL. The issue of a TMDL for sediment especially in the estuary can be address if sediment pore water is analyzed to account for bioavailability.	
42		<p><b>Section 5. Source Analysis</b>  <b>5.1.1 Use of Environmental Data in Source Analysis Section</b>  A CD of Table 35 data should be made available to those that desire it. Table 35 does not include available data from surface runoff from 4 irrigation crops, 1 orchard and 2 residential sites during irrigation and rainfall events in southern Ventura County, Sept. 1999 to April 2000, Chapters 3, 4 and 5 on land use-specific organophosphorus insecticide flux load estimations from the UCLA thesis under my mentorship in 2001 by Dr. Joel Pedersen, (see attached) for these data and associate water quality.</p>	The data is available from Regional Board.
43		<p><b>Section 5.1.2 Development of Summary Statistics.</b> The summary statistics proposed are exactly the one used in Section 3.1.1. The two types of source input are non-point source runoff listed in Table 36 and point source runoff from treatment plants. The data are evaluated in a consistent manner with Section 3.1.1 for Treatment Plant Effluent by using grab samples of effluent. This is a direct comparison with a stream sample as both are continuous flowing streams. As discussed before, it would be best to complete flow composite analysis. In fact, that would be recommended for all future sampling. All of the comments presented in reviewer’s General Comments 7 for the decision to use grab and composite data as equivalent applies here as well for point source samples from the treatment plant effluents. This includes data presentation.</p>	See response to comment 15, above.
44		This reviewer does not think that grab sample data can now be	See response to comment 19, above.

	Reviewers Comment number	Comment	Response
		evaluated properly for non-point source runoff. This is completely discussed in General Comment #8. EMC should be used to compare sites.	
45		Of importance, other OPs were not evaluated and should be part of the TMDL standard in terms of the relative potency factors as completely discussed in General Comment #5. A combination of individual OPs and Total Toxicity of OPs would also be acceptable to this reviewer. The authors concerns of using total sample analysis and not separating suspended solids and aqueous phase concentrations are completely described in General Comment #6.	See response to comment 5, above.
46		<b>5.3.2 Phase Out of Use of Diazinon and Chlorpyrifos.</b> The phase out of chlorpyrifos and diazinon is recognized by the authors. Once again, this is the reason to investigate all OPs and develop TMDL standard in terms of the relative potency factors as described above. This section recognizes the problem of phase out and accepts it, but does not act upon it. It should act upon it.	All OPs were investigated in the TMDL work plan monitoring. Furthermore, all available data were considered when analyzing the results of toxicity tests. Diazinon and chlorpyrifos were the only OPs identified as contributing to toxicity. As such, these two are the only ones discussed in detail in the report. It would be premature to include all potential pesticides in this TMDL and would be outside the 303(d) process. Additionally, the Monitoring Plan calls for the analysis of water and sediment for potential replacement pesticides. The RPF is discussed in comment 5, above
47		<b>5.3.3.3 Agricultural Application Compared to In-Stream Concentrations.</b> No correlation was observed on Figure 15. The	See response to comment 19, above.

	Reviewers Comment number	Comment	Response
		reviewer feels this is probably the case because of the use of total sample analysis (General Comment # 6) and grab sample analysis (General Comment # 7) especially for agricultural runoff. An understanding of soluble and suspended solid EMCs from agricultural runoff vs. in-stream composite samples of the aqueous phase alone and the suspended solids phase alone would be a more appropriate evaluation.	
48		<p><b>5.3.4.2 Estimated Time Frame/Reduction as a Result of Phase Out</b></p> <p>This discussion again should investigate all OPs and develop TMDL standard in terms of the relative potency factors as completely described in General Comment #5.</p>	See response to comment 5, above.
49		<p><b>5.4 Summary.</b> The summary should summarize the chapter. The summary that is presented belongs within the discussion of this section of the TMDL. Figures from Pedersen's data should be plotted in the same manner and compared to the data shown as these data are for EMCs and correctly reflect soluble diazinon and chlorpyrifos runoff events. Data for malathion is also available from Pedersen's study. The reviewer does not understand the basis of Figure 24 about loading by land use. If the basis is by actual concentrations by grab sampling analysis, the reviewer believes it is not correct because EMC loading should be compared as completely described in General Comment #7. The attached Chapter 3-5 from Pedersen's thesis approaches this evaluation by EMCs.</p>	The current summary provides sufficient information to wrap up the characterization of the sources based on the available information. Pedersen's data are few when compared to the entire data set and were collected from sources that are not comparable to the other data. To use this data would result in a data analysis using non-comparable data.
50		<p><b>Section 6. Linkage Analysis.</b> This reviewer suggests a linkage analysis addressing all OPs is needed. The more detailed model and linkage analysis was not provided to the reviewer.</p>	The current linkage analysis adequate to the needs of the TMDL. See response to comment 5, above

	Reviewers Comment number	Comment	Response
51		<p><b>Section 6.1. Model Selection.</b> The scientific reasoning for understanding sources and sinks of OPs by modeling is well stated. Table 47 describes the different models. Table 47 should list the models on top of the columns and not Type 1 etc. The choice of model, the “large box model”, is acceptable.</p>	Comment noted.
52		<p><b>Section 6.3. Data Used in Model.</b> The authors in this section describe the limitations of the data available to validate the model. The reviewer agrees with their analysis.</p> <ul style="list-style-type: none"> <li>- Detection levels for the majority of chlorpyrifos samples are too high to be environmentally relevant.</li> <li>- Several subwatersheds do not have detected data corresponding to wet weather sampling.</li> <li>- Most of the runoff and receiving water data sets have &lt; 40% detected values. Therefore statistics are considered estimates and are subject to error.</li> </ul> <p>The authors should consider the following limitations of the model and data available to validate the model.</p> <ul style="list-style-type: none"> <li>-The model assumes equilibrium conditions between phases (e.g., aqueous and a solid phase). Therefore samples collected and equilibrated with the solid phase within the sample before analysis is the approach for field analysis and comparison to the model.</li> <li>- The suggested changes in the use of grab and composite samples as equivalent and equally representative of the sampled water as completely described in General Comment #7. Composite samples should be given more weight.</li> <li>- The data use of total sample concentration data from the different sources as completely described in General Comment #6. Samples that have been separated into aqueous and suspended solids phases should be given more weight.</li> </ul>	<p>The discussion of the limitations of the model are correct and staff agrees that the model is adequate for purposes of TMDL</p> <p>See response to comment 19, above.</p>

Comments and Responses to Dr. Mel Suffit

	Reviewers Comment number	Comment	Response
		<ul style="list-style-type: none"> <li>- The data from agricultural and urban sources is treated as grab sample data. The reviewer has described in General Comment #7 that the EMC should be used from agricultural and urban sources and the model should be developed to be able to accept EMCs. This is not the way the data are used now for the model.</li> <li>- The reaches that only have POTWs as primary inputs could use grab sample and composite sample input loads and concentrations in the model. Composite samples should be given more weight. However, again, the problem of using the total sample concentration data instead of the soluble and suspended solid data analysis data must be considered.</li> <li>- The reviewer questions the following statement “estimated and qualified data are used as normal detected values”. This is not quantitative data and is best not treated as such.</li> </ul>	
53		<b>7. TMDL and Allocations.</b> The approach used by the authors appears straightforward, if the data was available and used appropriately.	Staff agree.
54		<b>7.2 Comparison of Capacity to Current Loads</b> The authors hypothesize that the sediment criteria is met if the water quality goals are met. The reviewer does not subscribe to this conclusion in Mugu Lagoon. In Mugu Lagoon, the time the OPs are present in the sediment may be extensive. The analysis of sediment pore water and sediment needs to be completed in the estuary to prove the hypothesis.	Additional information has been included to the Technical Report to support the conclusion that water quality targets will address sediment toxicity associated with chlorpyrifos. At this time, there is no data that toxicity in Mugu Lagoon is caused by OPs.
55		The % reduction for chlorpyrifos sources is >98 %, if the data in the report is correct. Thus, almost no use of chlorpyrifos appears acceptable for any purpose. The % source reduction for diazinon is > 85 % except in the estuary, where it is degraded. This essentially	The >98 percent reduction calls for better management in use of the pesticides. This is the case regardless of the pesticides used. However, the toxicity

	Reviewers Comment number	Comment	Response
		says alternative chemicals must be used. However, if these alternatives are OPs, no TMDL will exist. This is another strong reason to conduct the TMDL evaluation for all OPs as completely described in General Comment #5.	targets provide a mechanism for triggering further investigation and identifying toxicants.
56		<b>Section 6.4. Computational Elements.</b> Figure 26, I agree with this, in concept. The sediment phase is not included in the model and appears very important for chlorpyrifos as described above. Sediment should be extremely important in the estuary. This should be considered in the model especially for the estuarine part. The authors use a power curve as a regression for the data, which is fine. The inputs to the model are the data calculated throughout the document. Since this reviewer has problems with the data used for modeling (Section 6.3 above), the modeling exercise presented is just that - an exercise with input numbers.	There were insufficient data to consider the sediment phase. The level of analysis was appropriate given the available data.
57		<b>Section 6.5 Model Output.</b> The model output is described as overpredicting the data measured.	Comment noted.
58		<b>Section 6.6 Conclusions.</b> The reviewer feels the conclusions should list all the model assumptions and problems. The sensitivity analysis indicates that the data are not sensitive to change of concentration values. This is explained by the authors as caused by the high amount of reduction of OPs needed (70-99). If more precise data was collected, would the model be able to meet its objective of “understanding sources and sinks” of OPs. (Page 81)? Will the model be quantitatively valid to changing concentrations?  Figure 29 (so-called Figure 1 on P. 95) shows the model output of concentration vs. river flow using the TMDL data input presented in the report. The model output is said to, “overpredict” the	The model will be validated with additional data collected through the Monitoring Plan as appropriate.

Comments and Responses to Dr. Mel Suffit

	Reviewers Comment number	Comment	Response
		measurements. The reviewer questions the appropriateness of the input measurements. If the measured data were refined, will they better conform to the model output?	
59		<p><b>7.3 Waste Load Allocations and Load Allocations</b></p> <p>The reviewer agrees that alternative 5 using Numeric Targets is best for a total OP TMDL. In fact, P. 109 almost calls for it as stated “due to the possibility of additive or potentiated toxicity” other OPs are additive.</p> <p>The authors back out of the statement holding it off for the future. This reviewer says now.</p> <p>The other chemicals that could cause synergistic effects on toxicity such as the triazines need further research. This is a future consideration.</p>	See response to comment 5, above.
60		<p><b>8.3 Special Studies</b></p> <p><b>#1 Estuary Sediment</b> – Studies should include estuary sediments and pore water study to define bioavailable concentrations of all OPs and their RPF, as described above.</p> <p><b>#2 Modeling</b> – The EMCs of non-point source runoff should be calculated and used in the model as inputs and not grab samples as completely described in General Comment #8.</p>	The Monitoring Plan includes sediment toxicity and chemistry testing. The development of EMCs will be considered during the monitoring phase of the Implementation Plan.
61		<b>8.3.1. Special Study 1.</b> This study was completed by Joel Pedersen 2001, UCLA thesis under my mentorship, Chapters 3, 4 and 5 (attached).	The study completed by Pedersen focuses on agricultural sources and additional data and context are required for TMDL analyses.
62		<b>8.5. Monitoring Plan.</b> The monitoring plan is acceptable if changed to include the recommendations of the General Comment	All OPs will be included in the Monitoring Plan. In addition, the

	Reviewers Comment number	Comment	Response
		<p>section.</p> <ul style="list-style-type: none"> <li>- All OPs should be monitored.</li> <li>- The solid and the aqueous phase should be monitored individually.</li> <li>- Composite samples should be collected for flowing stream evaluation. If grab samples are collected, composite samples should be given more importance.</li> <li>- Flow weighted composite samples should be collected for “Event Mean Concentration” data for non-point source runoff data to quantify average mass load contributions of pollutants during a storm or irrigation event for agricultural or urban runoff.</li> </ul>	<p>monitoring plan will include criteria to determine storm conditions under which the solid and aqueous phase will be monitored.</p> <p>EMC data will be generated at stations where composite samplers are already in place. If, after the implementation of the Monitoring Plan, it is determined monitoring stations where grab samples are collected are not providing sufficient information, composite sampling will be considered.</p>
63		<p><b>8.5.1 Compliance Monitoring.</b> Table 61 should add sediment and fish samples for Mugu Lagoon, as that is where juvenal fish are exposed. Table 61 should include soluble and SS analysis for organics.</p>	<p>Sediment and fish samples for Mugu Lagoon as well as the other subwatersheds are included in Table 61.</p>